REMARKS

In the Office Action, claims 1, 19 and 21 were rejected under 35 U.S.C. § 102(b) as being anticipated by Pflugrath et al., (U.S. Patent 5,722,412, hereinafter "Pflugrath"). Claims 4-8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pflugrath in view of Little et al., (U.S. Patent 5,893,363, hereinafter "Little"). Claims 22 and 23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pflugrath in view of Chiang et al., (U.S. Patent 5,590,658, hereinafter "Chiang").

By the present Response, independent claims 1, 13, 21, and 26 are amended. These amendments do not add any new matter. Upon entry of the amendments, claims 1-27 will be pending in the present patent application. Reconsideration and allowance of all pending claims are requested. The Applicants respectfully request reconsideration and allowance of the pending claims in view of the following remarks.

Discrepancies in Office Action Rejection

Applicants wish to point out discrepancies in the Office Action mailed on October 5, 2007. In the "Claim rejections – 35 USC § 102" section on page 2, line 11, the Examiner mentioned that "[c]laims 1, 19 and 21 are rejected under 35 U.S.C. § 102(b) as being anticipated by Pflugrath (US 5722412)". However, claim 19 has been withdrawn by an earlier response filed on May 17, 2007. The Examiner has made further note of that in on page 1, line 22 in the current Office Action mailed on October 5, 2007. This Response is being filed under the assumption that rejection of claim 19 is unintended and claims 1, 13 and 21 are rejected under 35 U.S.C. § 102(b) as being anticipated by Pflugrath.

Rejections Under 35 U.S.C. §102

Claims 1, 13 and 21 were rejected under 35 U.S.C. § 102(b) as being anticipated by Pflugrath. Claims 1, 13 and 21 are believed to be patentable as discussed below.

Claims 26-27 have not been rejected on the basis of prior art. Applicants assume that they are thus allowable over the art.

Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration. Applicants respectfully assert that the present invention, as recited in independent claims 1, 13 and 21, is patentable over Pflugrath.

Independent claims 1, 13 and 21 and their dependents

Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration. Independent claim 1, as amended, recites, *inter alia*, a probe. The probe includes a plurality of reconfigurable pulsers within said probe is responsive to one or more transmit timing signals received from an external system to transmit pulses to said plurality of transducers, wherein each reconfigurable pulser is coupled to a respective transducer. Claim 13 recites *inter alia*, a probe. The probe includes a plurality of transducers and an array of reconfigurable pulsers, each transducer responsive to pulses from a dedicated said reconfigurable pulser, wherein each reconfigurable pulser is coupled to a respective transducer. Similarly, claim 21, recites, *inter alia*, a method for operating a transducer probe. The method includes operating a plurality of transducers utilizing signals from said plurality of reconfigurable pulsers, wherein each reconfigurable pulser is coupled to a respective transducer.

Pflugrath fails to teach plurality of reconfigurable pulsers within a probe responsive to one or more transmit timing signals received from an external system to transmit pulses to said plurality of transducers, wherein each reconfigurable pulser is coupled to a respective transducer.

In the "Claim Rejections" section, on page 2 of the current Office Action, the Examiner suggested that Pflugrath is believed to teach plurality of pulsers within said probe responsive to one or more transmit timing signals received from an external system to transmit pulses to said plurality of transducers, and referred to FIG. 5 and the elements ASIC 20, ASIC 30 and ASIC 50. The Applicants refer to the relevant details of the

elements ASIC 20, ASIC 30 and ASIC 50 as described in col. 4, line 50 – col. 5, line 6 of Pflugrath. The cited passage reads:

> Referring now to FIG. 5, the transmit/receive ASIC 20 is shown in greater detail. This ASIC is comprised of sixteen sections, each of which is coupled to six transducer elements of the array 10. The illustrated section 20a is coupled to elements 1, 17, 33, 49, 65 and 81 at the terminals on the left side of the drawing. With six elements per section, the entire ASIC can operate with a 96 element transducer. Each section could be configured to operate with eight elements, in which case the ASIC could control a 128 element transducer, for instance. Prior to the transmission of an ultrasonic pulse for a scanline, a serial stream of data from the front end ASIC 30 is clocked into transmit aperture select logic 206 at the Transmit Data In and Clk terminals at the right side of the drawing. The transmit aperture select logic 206 uses this data to set multiplexer switches in 3:1 transmit muxes 208 and 210 for the transducer elements that will be active for the particular scanline. For instance, the next scanline to be transmitted may have a transmit aperture comprising elements 1-32. This requires that transmit mux 208 closes a switch to connect pulser 202 to the element 1 terminal, and the transmit mux 210 closes a switch to connect pulser 204 to the element 17 terminal. In a similar manner the transmit muxes in the other fifteen sections of the ASIC will connect pulsers to element terminals 2-16 and 18-32.

The cited passage from Pflugrath does not support the Examiner's position, however. In describing the hand held ultrasonic instrument provided in a portable unit which performs both B mode and Doppler imaging, nowhere does Pflugrath teach a plurality of reconfigurable pulsers within a probe responsive to one or more transmit timing signals received from an external system to transmit pulses to the plurality of transducers, *wherein each reconfigurable pulser is coupled to a respective transducer*. Indeed, one skilled in the art would clearly understand that the pulsers are *simply grouped in arrays*. Pflugrath, at the very least, never indicates that *any pulser can be reconfigurable* and moreover, *that each reconfigurable pulser is coupled to a respective transducer*. The Applicants' claimed invention on the other hand discloses pulsers that can be reconfigured

to such that each pulser *is coupled to a respective transducer in a* many-to-many mapping from the low voltage timing signal to pulsers 12, and from pulsers 12 to transducers 38, respectively. Lines 1-9 of paragraph 28 of the Applicants' invention elaborates this further:

> In yet other configurations of the present invention and referring to Figure 6, *each transducer element 38 is associated with its own dedicated high voltage pulser 12 in an array of pulsers*. Each high voltage pulser 12 is responsive to a corresponding dedicated reprogrammable timing circuit (TC) 54 in an array of timing circuits. These configurations do not require a multiplexer in circuit as described above. Instead, a single start of frame or start of line signal is propagated in parallel to all timing circuits 54 in the array. In this manner, timing variations between different channels 34 are significantly reduced and phase alignment between channels 34 is greatly improved. (Emphasis added)

The method taught by Pflugrath relates to a portable ultrasound system that includes a transducer array and a sampled data beamformer for delaying and combining samples of echo signals received by elements of array transducer, wherein the transducer array and the beamformer are located in a common enclosure. Pflugrath *discloses use of multiplexers to allow sharing of the pulsers 202 with multiple transducer elements*. Applicants' claimed invention, on the other hand, relates generally to methods and apparatus for efficiently operating a probe having a large number of transducer elements such that each of the "dedicated" pulsers is coupled with a respective transducer element. Any comparison to what Pflugrath proposes *has not been demonstrated by the Examiner as even being similar, much less the same as* the recited embedding technique.

In summary, Applicants respectfully submit that Pflugrath cannot support a *prima facie* case of anticipation of independent claims 1, 13, and 21. Accordingly, Applicants respectfully request the Examiner to reconsider and withdraw the rejection of these claims under 35 U.S.C. 102(b).

Rejections Under 35 U.S.C. § 103

The Office Action summarizes that claims 4, 5, 13 and 14 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pflugrath in view of Little. Claims 6 and 7 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Pflugrath in view of Little. Claims 22 and 23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pflugrath in view of Chiang.

As discussed above with regards to 35 U.S.C. § 102(b) rejection above, the primary reference Pflugrath fails to teach plurality of reconfigurable pulsers within a probe responsive to one or more transmit timing signals received from an external system to transmit pulses to said plurality of transducers, wherein each reconfigurable pulser is coupled to a respective transducer. This deficiency of Pflugrath is not overcome by the secondary references.

Neither Little nor Chiang teaches plurality of reconfigurable pulsers within a probe responsive to one or more transmit timing signals received from an external system to transmit pulses to said plurality of transducers, wherein each reconfigurable pulser is coupled to a respective transducer.

First, Little fails to obviate the deficiencies in the teachings of Pflugrath. Specifically, Little fails to disclose an array of reconfigurable pulsers, and specifically each reconfigurable pulser being coupled to a respective transducer as claimed in independent claims 1, 13 and 21.

In the "Claim Rejections" section, on page 4, lines 1-3 of the current Office Action, the Examiner stated that Pflugrath does not teach an ultrasound system with a low voltage multiplexer, and the Examiner relied on Little solely for the disclosure of an ultrasound system wherein multiplexers have inputs coupled to said low voltage inputs and outputs coupled to the transducer drivers. Further, on page 4, lines 6-10 of the current Office Action, the Examiner stated that Pflugrath does not teach pulsers to be bipolar, unipolar or combination of both and a conversion to set the timing signal to

operate with low voltage pulsers. The Examiner relied on Little solely for the disclosure of applying drive signals for unipolar pulsers (202) to each terminal of the pulsers as well as the complementary waveforms applied when bipolar signals are used. Again, on page 4, lines 15-18 of the current Office Action, the Examiner stated that Pflugrath does not teach a digital-to-analog converter in the handle to transmit timing signals. The Examiner relied on Little solely for the disclosure of a digital-to-analog converter (338) used in a handle to convert the transmit signals to analog format for the use of pulser.

Applicants respectfully state that Little does not teach or disclose plurality of reconfigurable pulsers within a probe responsive to one or more transmit timing signals received from an external system to transmit pulses to said plurality of transducers, wherein each reconfigurable pulser is coupled to a respective transducer. The system taught by Little relates to portable, configurable and scalable ultrasonic imaging system that uses a phased ultrasonic transducer array coupled to a portable, configurable and scalable ultrasonic processor to develop ultrasonic images. Applicants' claimed invention, on the other hand, relates generally to methods and apparatus for efficiently operating a probe having a large number of transducer elements. In describing the portable, configurable and scalable ultrasonic imaging system, nowhere does Little teach a *plurality of reconfigurable pulsers within a probe responsive to one or more transmit timing signals received from an external system to transmit pulses to a plurality of transducers, wherein each reconfigurable pulser is coupled to a respective transducer.*

Chiang fails to obviate the deficiencies in the teachings of Pflugrath. Specifically, Chiang fails to disclose an array of reconfigurable pulsers, and specifically each reconfigurable pulser being coupled to a respective transducer as claimed in independent claims 1, 13 and 21.

In the "Claim Rejections" section, on page 5, lines 5-7 of the current Office Action, the Examiner stated that Pflugrath does not teach signals from the external system

to comprise timing signals. The Examiner relied on Chiang solely for the disclosure of pulsers (22-1-n) to synchronize the signal to be sent to the transducer (18-1-n). Further, on page 5, lines 11-14 of the current Office Action, the Examiner stated that Pflugrath does not teach a plurality of the transducers utilizing signals from the plurality of pulsers. The Examiner relied on Chiang solely for the disclosure of every individual transducer (18-1-n) being in contact with the dedicated pulsers (22-1-n) through a high voltage driver.

Applicants respectfully state that Chiang does not teach or disclose a plurality of reconfigurable pulsers and specifically, that each reconfigurable pulser being coupled to a respective transducer. The system taught by Chiang relates to a portable ultrasound imaging system that includes a handheld scan-head coupled by a cable to a portable battery-powered data processor and display unit, preferably in the form of a lap-top computer. In describing the portable ultrasound imaging system, nowhere does Chiang *plurality of reconfigurable pulsers within a probe and specifically, each reconfigurable pulser being coupled to a respective transducer.*

In summary, neither Pflugrath nor Little nor Chiang teach, suggest or disclose plurality of reconfigurable pulsers, specifically such that each reconfigurable pulser is coupled to a respective transducer as recited in independent claims 1, 13 and 21. Consequently, independent claims 1, 13 and 21 are clearly allowable, and dependent claims 4, 5, 6, 7, 8, 22 and 23 are allowable at least by virtue of their dependency from an allowable base claim. Thus, it is respectfully requested that the rejection of these claims under 35 U.S.C. 103(a) be withdrawn.

Conclusion

In view of the remarks and amendments set forth above, Applicants respectfully request allowance of the pending claims. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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